THE CLAIMS

What is claimed is:

1. A method of producing a product substrate, which comprises:

providing a donor wafer that is substantially free of foreign atomic species;

implanting atomic species into the donor wafer to a preselected depth therein to form a weakened zone below a bonding face of the donor wafer to define a transfer layer between the weakened zone and the bonding face, the weakened zone being configured to facilitate detachment of the transfer layer;

bonding the donor wafer at the bonding face to a support;

detaching the transfer layer from the donor wafer along the weakened zone to obtain a product substrate that comprises the support and the transfer layer; and

diffusing atomic foreign species into the transfer layer, wherein the foreign species is selected to modify at least one of the electrical or optical properties of the transfer layer.

2. The method of claim 1, wherein foreign atomic species is diffused into the transfer layer after detaching the transfer layer from the donor wafer.

3. The method of claim 1, wherein foreign atomic species is diffused into the transfer layer prior to implanting the atomic species that form the weakened zone.

4. The method of claim 3, wherein the foreign species is diffused into the transfer layer to a depth that is smaller than the depth of implantation of the atomic species that form the weakened zone.

5. The method of claim 4, which further comprises thinning the transfer layer after the detaching to remove a portion thereof that is substantially free of the foreign atomic species.

6. The method of claim 1, which further comprises producing a bonding layer on at least one of the bonding face of the donor wafer or on the support, or on both, to improve bonding strength therebetween.

7. The method of claim 6, wherein that the bonding layer is configured to form a buried insulator in the product substrate.

8. The method of claim 1, wherein transfer layer comprises a Group III-V semiconductor.

9. The method of claim 8, wherein the foreign atomic species is selected to render the transfer layer to be semi-insulating by the diffusion of the foreign atomic species therein.

10. The method of claim 9, wherein the transfer layer is made of indium phosphide.

11. The method of claim 10, wherein the foreign atomic species comprises at least one of iron or rhodium.

12. The method of claim 10, wherein the foreign atomic species comprises a shallow acceptor and a shallow donor.

13. The method of claim 1, wherein the implanted atomic species that forms the weakened zone comprises at least one of hydrogen ions and rare gas ions.

14. The method of claim 1, wherein the support material is mechanically stronger than the transfer layer.

15. The method of claim 1, which further comprises epitaxially growing an epitaxial layer on the transfer layer of the substrate after the detaching.

16. The method of claim 15, wherein the epitaxial layer has a lattice structure that is different than that of the transfer layer.

17. The method of claim 1, wherein the transfer layer has a thickness of less than about 10 μm.

18. The method of claim 1, wherein the detaching of the donor wafer is achieved by applying stress to the weakened zone.

19. In a method for producing a product substrate by implanting atomic species into a donor wafer to a preselected depth therein to form a weakened zone below a bonding face of the donor wafer to define a transfer layer between the weakened zone and the bonding face, the weakened zone being configured to facilitate detachment of the transfer

layer; bonding the donor wafer at the bonding face to a support; and detaching the transfer layer from the donor wafer along the weakened zone to obtain a product substrate that comprises the support and the transfer layer; the improvement which comprises diffusing atomic foreign species into the transfer layer prior to or after detaching, wherein the foreign species is selected to modify at least one of the electrical or optical properties of the transfer layer.

20. A donor wafer for transferring a layer therefrom to a support, the donor wafer comprising:

at least one transfer layer of a crystalline material that has a predetermined thickness and comprises a semiconductor material suitable for fabricating a substrate for microelectronics, optoelectronics or optics when transferred to the support; and

a foreign species diffused into the transfer layer to a depth that is less than the predetermined thickness of the transfer layer;

wherein the foreign species is selected to modify at least one of the electrical and optical properties of the transfer layer semiconductor material.

21. The donor wafer of claim 20, wherein the transfer layer has an exposed bonding surface configured for bonding to the support, and the foreign atomic species is disposed from the bonding surface to the depth.

22. The donor wafer of claim 20, wherein the atomic species that are implanted at the thickness substantially delimit the transfer layer and facilitate detachment of the transfer film from the donor wafer.

23. The donor wafer of claim 20, wherein the semiconductor material is a Group III-V semiconductor, and the foreign atomic species renders the transfer layer to be semi-insulating.

24. The donor wafer of claim 23, wherein the semiconductor material is indium phosphide.

25. The donor wafer of claim 24, wherein the foreign atomic species comprises at least one of iron or rhodium.